SILVOPASTORAL AGROFORESTRY FOR RURAL ENVIRONMENT SUSTAINABILITY AND VALORIZATION OF THE REGION OF GUARDA AND SERRA DA ESTRELA, PORTUGAL

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Abstract

In the region of Guarda, Portugal, silvopastoral systems play a very relevant part in the local economy. These systems are characterized by an integration of oaks and shrubs, high altitude and permanent semi-natural pastures, and a varied range of livestock production (some of which represent autochthonous species). This communication highlights the fact that the improvement of the production of these systems goods (like meat, milk, cheese) implies a more integrative management. The trees effect over pastures must be acknowledge, in order to have more productive, higher quality and longer availability of pastures. Also, the contribution of fruits (acorns) and leaves (ash branches) to the livestock diet should be further analyzed, alongside the need to consider the introduction of grassland species with soil improvement capabilities and higher nutritional value.

Keywords: silvopastoral systems; livestock management; high altitude pastures; rural development

Introduction

Guarda district is located in the central interior of Portugal. Part of it is enclosed within the Serra da Estrela Natural Park (Figure 1) (ICNB 2009). In this region, agricultural activities are strongly connected with high altitude pastures, where livestock silvopastoral management has a pronounced economic and landscape expression, despite the fact that the land property average size tends to be are very small, fragmented and dispersed. The altitude specificity, which gives a marked differentiation to these systems, has created conditions for a natural improvement of regional breads of sheep, goats and even bovines, and ensures the presence of several endogenous tree species that are not frequently distributed in other regions of the country. This communication describes the silvopastoral systems encountered in the region, and discusses available options for pastures improvement, including the importance of tree fodder has a complement for the farm self-sufficient feeding of the animals. It concludes on the importance of further research on these systems components.

Figure 1: Delimitation of the region of Guarda and Serra da Estrela Natural Park (Portugal).

Wood and shrub pastures

Some of the vegetation types found in Guarda and, particularly, in Serra da Estrela, include cervum and juniper (*Juniperus communis*) communities for the upper zone, several oak species (*Quercus pyrenaica, Quercus rotundifolia* and *Quercus suber*), chestnut (*Castanea sativa*) and ash (*Fraxinus angustifolia*) forests along with shrub areas of *Cytisus* sp., *Lavandula* sp., *Erica* sp. and *Genista* sp. for the intermediate zone, and *Pinus pinaster* plantations in the basal zone (Távora 1985; ICNB 2009). Meshed within these forest and shrubs mosaics are herbaceous clearings that are used as areas of permanent natural or semi-natural pastures (Ribeiro and Monteiro 2014), and serve as the main fodder resource for livestock is this region.

This livestock production consists mainly of pork (Bísaro) and cow (Limousin, Charolais and autochthonous Jarmelista cattle) for meat production, goat (autochthonous Serrana and Jarmelista goats (autochthonous)) and sheep (Lacaune and autochthonous Bordaleira Serra da Estrela and Churra Mondegueira) for production of meat, milk and cheese.

Of particular importance as a tree cover are the oak species that are, generally, found in the higher and more drained areas, and used for wood, biomass and tree fodder (leaf and acorns) collection (Castro and Fernández-Núñez 2016). Acorn, oaks fruit, is a carbohydrate-rich food with a high strategic interest for ruminant feed in this region, as it occurs at a time of the year (after the first autumn rains, usually from October to December) that allows it to value the low nutritional quality of pastures verified at that time. The management of these trees, in particular the promotion of the tree regeneration is of particular relevance for the long term sustainability of the farms, presenting similar challenges to the ones usually found in the *montado* and *dehesa* systems (Paulo et al. 2016).

Valorising trees within permanent semi-natural pastures

“Lameiros” are another traditional system of permanent semi-natural pastures normally located next to water lines. Their contribution to animal grazing and its maintenance is done through direct grazing and cutting for hay production. Despite its local importance, it is difficult to assess their extent area due to lack of official inventory data (Paulo 2015).They involve trees that are included either randomly or in hedges, borders and/or in riparian forests lines (Figure 2). Traditionally placed for field demarcation, these trees are important for fire wood consumption, animal fodder, soil protection from water or wind erosion (Pereira et al. 2004), pasture improvement (Pereira et al. 2005) and for animal welfare, namely, by serving as a natural shelter in defence against rain and wind in winter and by providing shade in summer.

Figure 2: “Lameiro” with pollarded trees in its hedges during summer (left photo) and winter (right photo) seasons (Guarda, Portugal).

High altitude pastures improvement

The main improvement needs are related with the increment of the dry matter production, the increase of the period were natural pastures are available, and the improvement of the pasture quality (Simões and Simões 2014). This can be achieved by studying the existing species adaptability (Moreira 1998), by increasing awareness of farmers about the importance of tree fodder by coppice and pollarding practices, the introduction of other species with soil improvement capabilities and higher nutritional value (like the legume *Trifolium subterraneum* L.) (Pires et al. 1994) and the study of the right timings for grazing (Amaro 2009) and its spatial control (e.g. through the use of fences).

Silvopastoral systems as a way to improve regional development

Silvopastoral agroforestry, as a sustainable system of land use, it is important not only for the production of livestock but also, and consequently, for the human occupation of the territory. Its applicability to marginal land areas, that do not have fitness for another type of activity, prevents them from remaining abandoned and conducive to biomass accumulation (Henriques and Lourenço 2013), potentially combustible under certain adverse climatic conditions (such as those which characterized the year 2017) (Silva 1965a, b; Castro 2008). In addition, the reconciliation of pasture with the native forest allows the recycling of nutrients through direct grazing and the accumulation of organic matter through the foliage fall of the trees, the fixation of atmospheric nitrogen in the soil through the pasture legumes and the reduction of greenhouse gases in the atmosphere through the carbon sequestration.

Agroforestry is therefore essential for sustainable territorial planning, landscape preservation and environmental prevention against climate change and forest fires. Likewise, it’s a way against the depopulation of the rural environment by promoting the regional economy, the development of endogenous products and the preservation of noble and characteristic products of the region such as the Queijo da Serra da Estrela, Borrego da Serra da Estrela, Cabrito da Beira, among others.

The farm advisor point-of-view: further research needs

Considering the importance of the mentioned agroforestry systems, there are still voids to be filled when applying them. These systems need some long term studies to determine the interactions between the different system components: pasture, tree, shrub, and livestock. For instance, acorns have nutritional components that seem to help livestock digest some pasture elements. The importance of tree fodder, shrubs, fruits and berries in terms of nutritional content and management practices (best timing to integrate them in the diet) in the livestock feeding is another topic in need of further evaluation and that would lead to the determination of the system’s carrying capacity considering all its components. This implies a real need for technical

assistance to the small farmer, more rural extension and integration between research, experimentation and application (Simões 2015).

Conclusion

In summary, the importance and potential of silvopastoral agroforestry for this region is very high. Besides the evident need for further pasture improvement, there's clearly also a knowledge gap in the farmer's traditional management plan related with the best ways and techniques to work with the other layers of these kind of systems, such as the tree cover. Not only considering the effects that trees can have on the pasture development and quality (by means of win-win interactions, particularly in terms of microclimate definition) but also as another livestock fodder input (fruit and branches) of the system precisely in times where the pasture is no longer available. This may even mean that investing in trees may actually translate into less expenses for the farmer, since they may delay the pasture senescence and decrease the need for forage buying in times of pasture scarcity.

Along these lines, research is indispensable for the knowledge and potentiation of this region natural resources, as well as for preserving the diversity of its products, for it is in the diversity that lies the richness and the affirmation of a region or a country in a globalizing strategy.

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